

TYPE A-3 CREST VOLTMETER

INTRODUCTION

The General Electric Type A-3 crest voltmeter measures the crest value of voltages within the range of the scale and the calibration of the particular instrument purchased. The maximum scale range for which a Type A-3 crest voltmeter is calibrated is 30,000 volts. The instrument will measure crest values which occur at least once a second and which remain at approximately crest value for at least a millionth of the interval between crests.

The Type A-3 crest voltmeter may be used in either design or production testing, to measure ignition voltages of internal-combustion engines. It can also be used to measure overvoltages caused by switching of electric circuits, and overvoltages from discharges that accompany high potential testing.

DESCRIPTION

The equipment consists of a self-contained capacitance voltage divider and a battery-operated electronic voltmeter.

At the top of the case is a porcelain insulator on which the high-voltage terminal is located. The indicating instrument on the front of the case is calibrated in kilovolts. There are two selector switches on the front of the panel; one for selecting the response time and a second one for selecting the polarity of the measured voltage. This second selector switch also contains the CHECK BATTERY and the OFF positions.

Power is furnished by two size D flashlight cells, Eveready No. 950 or equivalent, and one 67 1/2-volt dry battery, Eveready No. 467 or equivalent, contained within the case.

OPERATION

First set the left-hand switch to the FAST posi-

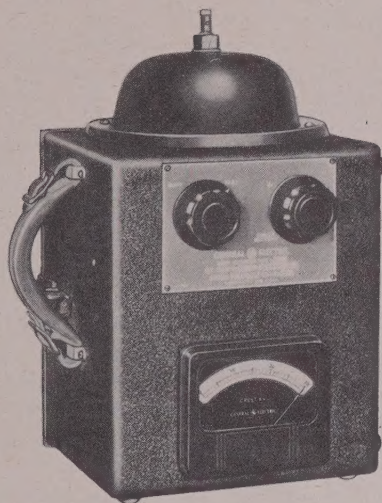


Fig. 1. Type A-3 crest voltmeter

tion. Set the right-hand switch to either PLUS or MINUS according to the polarity of the voltage to be measured. The indicating instrument should be set on zero by means of the adjusting knob on the front of its case. When these adjustments have been made, the crest voltmeter should be connected into the circuit. The leads should be short but not so short that the magnetic fields from any large transient currents, accompanying the voltage impulse, produce a false indication. To check against any possible resulting error, short circuit the voltmeter terminals and observe whether any apparent voltage indication occurs. The capacitance loading of the instrument increases as the length of the leads is increased.

If the voltage peaks occur at a rate less than ten per second, the left-hand selector switch should then be set to SLOW. However, if the peaks occur at a rate of ten or more per second, it should be left in the FAST position.

Note: The voltmeter will indicate full scale when in the OFF position.

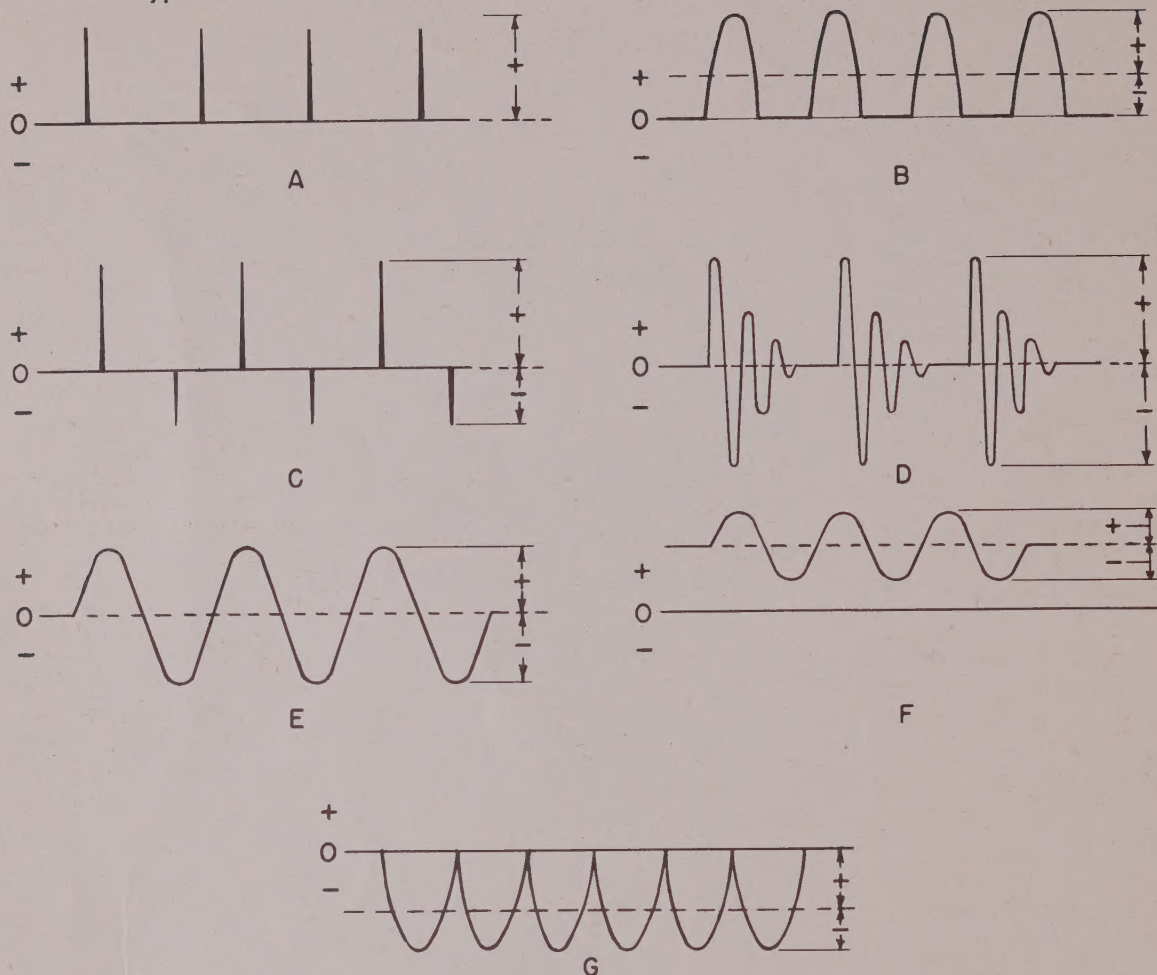
INTERPRETATION OF READINGS

Since the type of wave forms on which the customer may use the crest voltmeter may be quite varied, Fig. 2 has been included to facilitate the interpretation of readings. This figure illustrates some typical wave forms that may be encountered and shows the reference point "drawn" by the voltmeter, and the polarity and magnitude of the deviation from this point. The values marked + will be indicated by the instrument in the PLUS position; the values marked - will be indicated by the instrument in the MINUS position.

ACCURACY

The accuracy of instruments which are calibrated

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.



--- INDICATES AVERAGE VALUE OF WAVE (D-C COMPONENT)

Fig. 2. Illustrative diagrams of wave forms (see INTERPRETATION of READINGS)

for 0 to 5,000 volts, is plus or minus four percent of full scale; for other ratings the accuracy is plus or minus three percent of full scale. This accuracy will apply only when voltage impulses recur regularly and remain at approximately crest value for at least one-millionth of the interval between crests.

CALIBRATION

Calibration of the crest voltmeter can be verified by applying a 60-cycle voltage of known crest value. It is recommended that the methods used to establish the crest value of the applied 60-cycle voltage conform to AIEE Standard No. 4 dated March, 1943 (ASA Standard 68 1-1942).

Note: The crest value of 60-cycle voltages ordinarily available is likely to differ appreciably from the $\sqrt{2}$ x rms voltage. Therefore, it is usually not advisable to determine crest voltage by multi-

plying the voltage indicated on an rms voltmeter by $\sqrt{2}$.

PRINCIPLES OF OPERATION

The schematic diagram of the crest voltmeter is shown in Fig. 3. The 3S4 (V_1) pentode tube is connected as shown and is used as a rectifier. The capacitor (C_1) charges through the rectifier from the voltage source to be measured.

The other 3S4 tube (V_2) is connected as a triode, and is used as a d-c amplifier. The indicating instrument is in the cathode circuit in series with a resistor (R_{12}) and is also across the battery in series with R_{11} to provide a means to balance out the static plate current. The indicating instrument is a d-c microammeter, and the deflections on this instrument are proportional to the voltage applied at the input terminals of the crest voltmeter.

Because the Type A-3 crest voltmeter utilizes a capacitance divider, any d-c component which may be present will not be indicated.

The crest voltmeter draws its own average and uses this average as a zero reference point in indicating the amount of voltage deviation. Thus any crest value above the reference point will be indicated in the PLUS position and any crest value below the reference point will be indicated in the MINUS position.

MAINTENANCE

The 67 1/2-volt dry battery (Eveready No. 467 or equivalent) need be replaced only when it is no longer possible to set the instrument on zero. Usually this battery will outlast eight to ten sets of flashlight cells.

If the reading when the right-hand switch is on CHECK BATTERY is more than one-quarter full scale, it will be necessary to replace the two size D flashlight cells.

The batteries should be removed and stored

separately if the instrument is placed in storage. When in use all batteries must be mounted in the brackets provided because battery-to-case capacitance affects the calibration of the voltmeter.

The vacuum tubes used are Type 3S4 radio receiver tubes, which have been tested and selected to insure minimum gas content. If replacement is necessary, it is advisable to obtain them from the General Electric Company, Meter and Instrument Divisions, 40 Federal Street, West Lynn, Mass.

Reasonably dry atmosphere inside the case is necessary. For this reason the principal opening in the case walls is through a tube of activated alumina. As a general rule, this drying agent is adequate to keep the instrument dry for approximately one month in humid weather in temperate climates. In any event the drying agent should be reactivated when the time required for the voltmeter reading to decrease to half value is less than one half minute with the switch in the SLOW position. Reactivation is accomplished by heating the drying tube to approximately 400 F, but not over 500 F, for at least an hour. The tube should be allowed to cool so that it can be handled with bare hands before it is returned to the case.

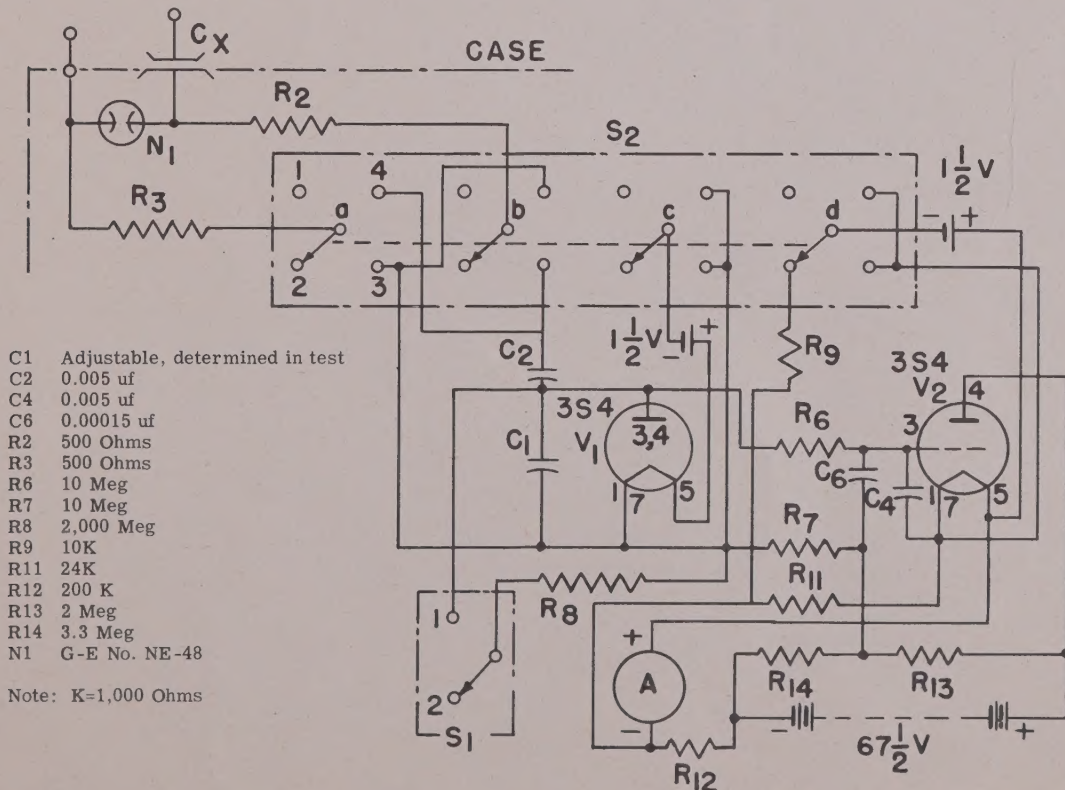


Fig. 3. Schematic diagram of Type A-3 crest voltmeter

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IF AT ANY TIME you find it necessary to repair, recondition, or rebuild your G-E apparatus, there are 30 G-E service shops whose facilities are available day and night for work in the shops or on your premises. Factory methods and genuine G-E renewal parts are used to maintain the original performance of your G-E apparatus. If you need parts only, immediate shipment of many items can be made from warehouse stock.

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